

# TEXAS

APR 2 1974

## PARKS & WILDLIFE

February 1974 • 50¢



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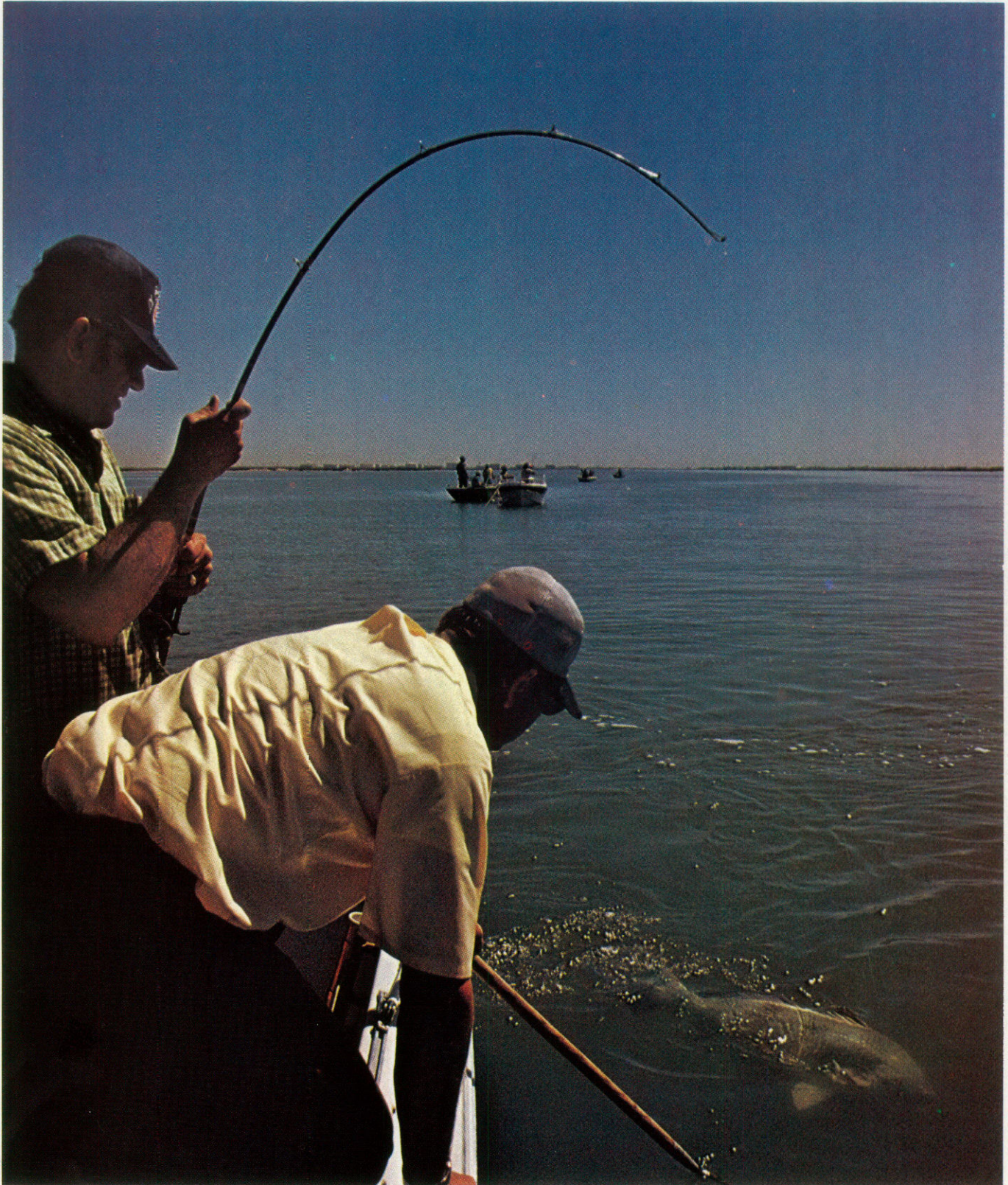
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**Front Cover:** Lichens are actually a combination of algae and fungus living  
together in a symbiotic relationship with the fungus providing the water and  
support while the algae provides food. Photo by Jim Whitcomb.

**Inside Front:** This curious pair of thirteen-lined ground squirrels has come  
up to the top of their burrow to have a look around. Photo by Martin T.  
Fulfer.

# Drag Up a Drum

Article and photographs by Neal Cook



**Some say** they fight like a water-soaked log being rolled across the bottom by the tide, but for many anglers the bottom-hugging, tackle-straining black drum is "the" saltwater fish in the late winter and early spring.

During the period from late December through April, with a peak in late February through March, these big "bull" and "sow" drum move from the Gulf into the bays and congregate along channels and turning basins. Catching 40- and 50-pounders is not uncommon. The state record is 78 pounds, the world record is over 110 pounds and a maximum size of over 140 pounds has been recorded. Size seems to be the main attraction since they are not spectacular fighters and they are not as tasty as smaller drum.

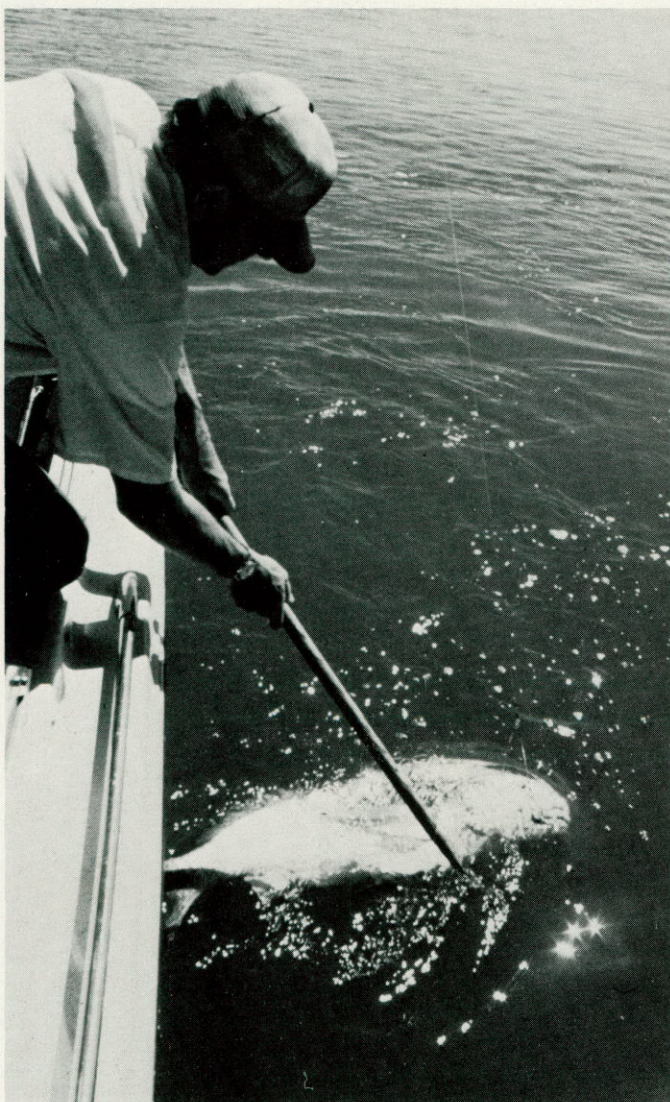
Drum are members of the croaker family which also includes the redfish and sea trout. They are found from New York to Mexico with a high population in Texas' waters. Smaller drum, up to 11 pounds, are excellent tablefare and many of these smaller ones are caught and sold by commercial fishermen. These smaller drum are also caught year-round by sport fishermen seeking redfish, trout and flounder. They are bottom feeders and will eat about anything, including small

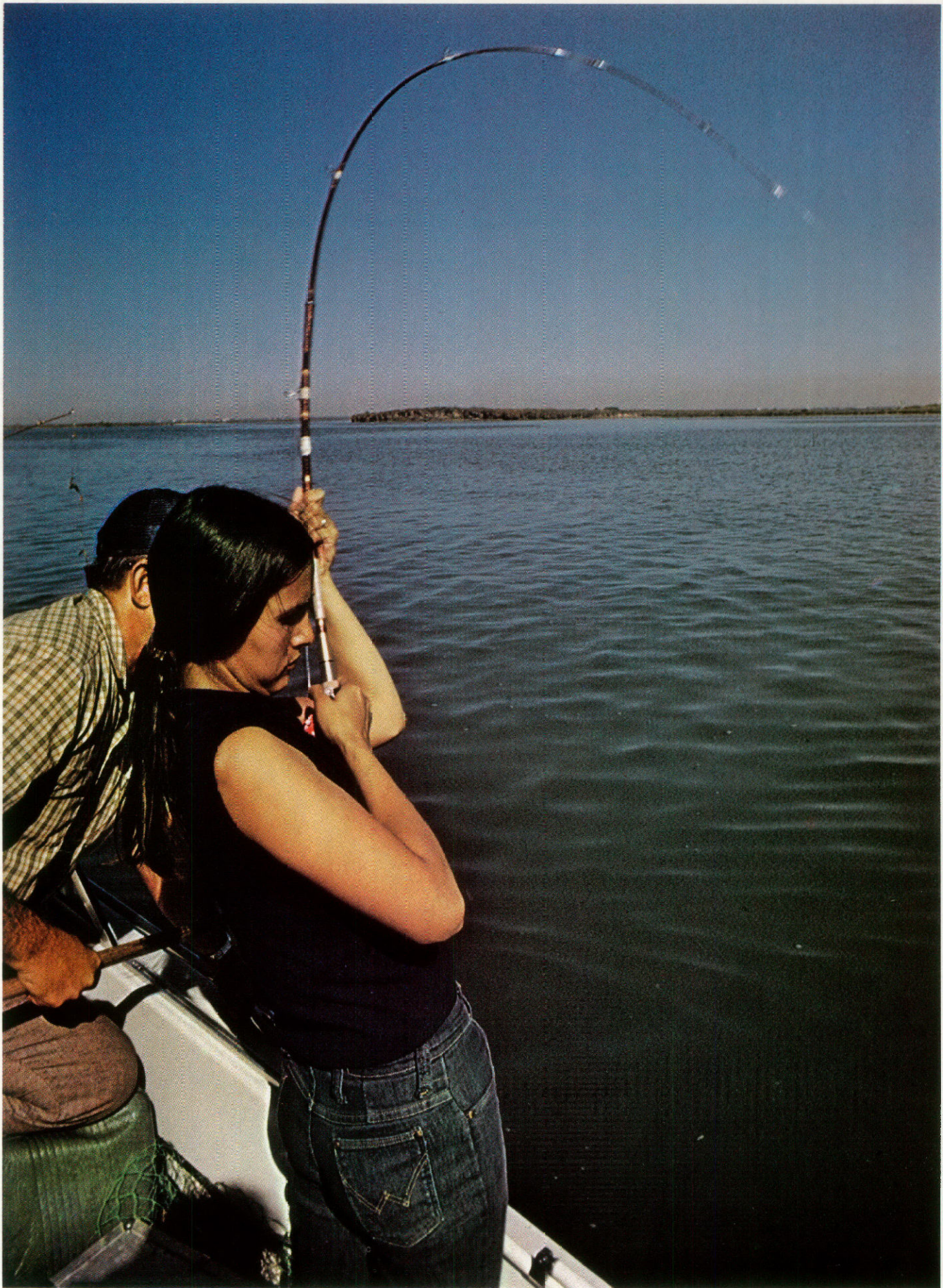
fish, barnacles, crabs, small oysters and other mollusks. Drum are equipped with a massive set of grinding teeth for crushing shellfish, and fishermen learn quickly that you don't reach into their mouth to dislodge your hook unless you want a crushed finger.

During the "drum run," fishermen congregate along the intracoastal canal and fish the dropoffs. When a school of the big drum move through, rods can be seen arched and straining in almost every boat.

To turn the fish back to shore, most bank and wade fishermen use heavy tackle, including 40- to 80-pound-test line, and boat or surf rods with plenty of backbone. Boat fishermen, on the other hand, are missing a lot of fun if they don't use about 25- to 30-pound line and a medium-action, six- to seven-foot rod. This tackle lends excitement to every catch and, with a lot of fisherman's patience and steady pressure, is stout enough to bring up almost any drum.

To keep the bait on the bottom, use about a four-ounce pyramid sinker on a double-hook "redfish rig." This braided wire or monofilament leader should have swivels at each staging and where the line is attached. Put the sinker on the bottom of the three stagings with 2/0 to 4/0 hooks on the other two.





When the spring migration of the big black drums begins, fishermen congregate along the channels and start the often tiring battle of bringing the fish up from the bottom. On light tackle, it's a matter of pumping the rod to gain line a foot at a time.

Probably the most popular bait is large dead shrimp, but cut mullet, squid and fiddler crabs are also used.

Fish along the dropoffs and, if you don't know of a good place to try, ask bait-stand operators or just look for a concentration of boats.

Almost all drum over 11 pounds have large parasitic worms along their backbones and in the lower third of their bodies which are harmless if eaten and have no ill effect on humans. However, they are large, unsightly and completely unappetizing, so to get rid of them, simply cut off the portion of the fish containing them and throw it away, or cut away the infested portions of meat. The parasites are large and easy to remove.

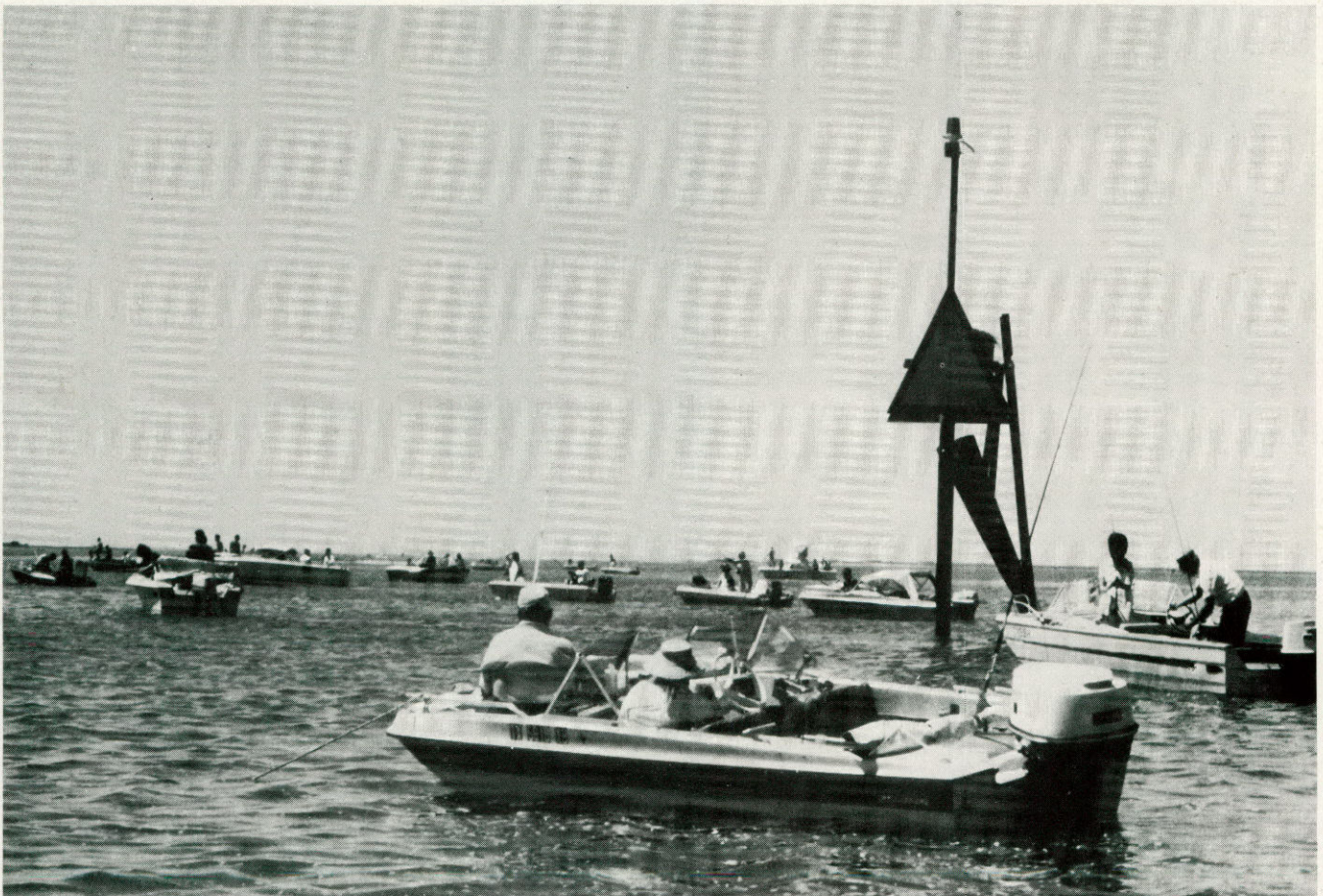
Although the flesh of these large drum is too coarse to be considered "delicious," it is still good smoked, barbecued, fried or fixed about any way.

Cleaning the fish is much like butchering a hog.

It takes patience and a strong knife, more like a skinning knife than a filleting knife. These big drum are hard to scale, so just remove enough scales to fillet the fish. Skinning the fillet will get rid of the rest.

There is a lot of dark red flesh on drum and it is up to you whether you want to remove this darker meat. It is a little stronger than the white meat, but is not objectionably flavored. Remove the dark gray or black skin which lines the body cavity because it does have an objectionable texture and flavor.

This spring, catch a few of these big, strong drum, and be prepared to spend anywhere from 10 minutes to an hour fighting the fish if you use light tackle. They like to stay on the bottom and it is a matter of getting only a foot of line at a time back on the reel. Once you get them near the surface, the battle is won. Then it's time for a gaff for the fish and a rest period for the fisherman. \*\*



# Conspicuous features on the landscape, yucca, sotol and agave are familiar landmarks

by D'Arcy James

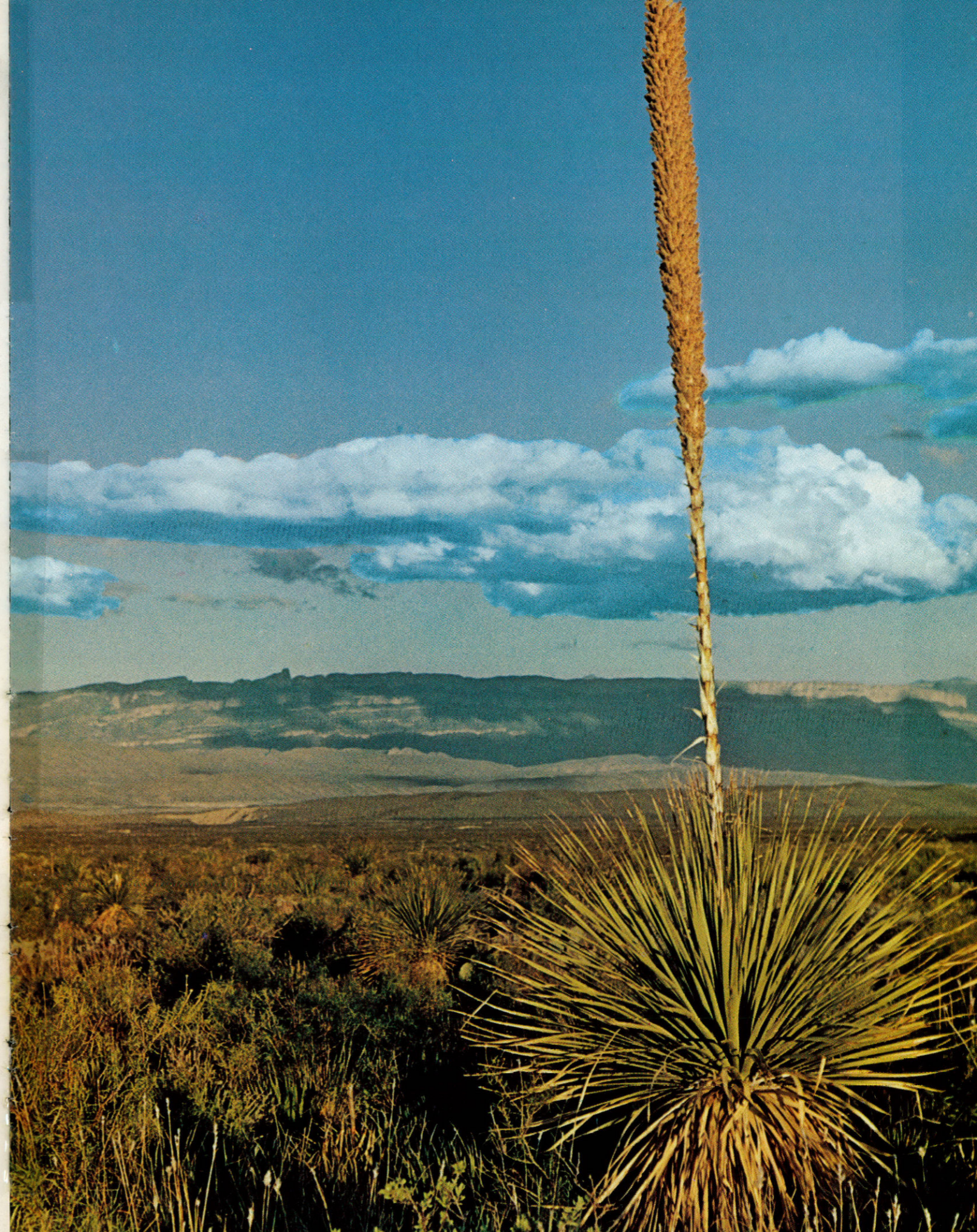
in the arid regions of West Texas. However, these unique plants can be located throughout Texas, with 23 native species of yucca, five of sotol and 14 of the agave.

Highly adapted for survival, the plants demonstrate the old aphorism that "form follows function." Non-cactus species, they are actually either cousins to the lily (yucca and sotol) or to the daffodil (agave). Their hardy design includes a shallow root structure that allows maximum access to any surface ground moisture and spiny and tough leaves to protect from foe or sun.

These radiating sword-leaved forms are often confused by the newcomer and thought to be the same plant. Common characteristics of all three are the sprouting direction of the thorny leaves and the central flowered stem, but their similarities end there. The most noticeable difference is in the leaves. The yucca and sotol both have thin, long, fibrous leaves, whereas the agave has a thick, succulent leaf. They are further differentiated by the presence or absence of a central trunk. Agave leaves grow from a central root system at ground level, but yucca and sotol leaves grow from a trunk. In the yucca, the leaves grow on the trunk one to four feet above the ground, and when spent, hang down around the central core giving a seasoned plant a palmlike look. New growth continues budding from the top. The sotol's trunk is beneath the ground, so the leaves begin at ground level.

Unassuming, but prickly during

Agave by Patricia Esteria







Yucca and sotol by Bill Reaves

most of the year, the yucca, sotol and agave shout their presence in the spring with the appearance of a long central flower stalk which may be up to 15 feet tall. These beckoning fingers announce the beginning of new generations. An exception to this yearly phenomenon is the species of agave, often misnamed the century plant, that will go through 10 to 30 springs without flowering. With the arrival of a flower and the seeds which follow, the agave completes its life cycle and soon withers and dies. Future generations sprout from the seeds broadcasted from the seed pods. Under less arid conditions, certain species of agaves multiply at the roots, sending out smaller plants around the base. The yucca and sotol, though, continue to flower almost annually.

The pollination of some species of yucca is a particularly interesting phenomenon. Although many creatures are attracted to the striking flower "plume," only one insect,

the yucca or pronuba moth, can carry out the pollination. It is an example of perfect symbiosis (mutually beneficial relationship) between plant and insect. One cannot produce future generations without the other. The tiny, whitish moth is attracted to only the yucca's bell-shaped flowers and flits in the evenings from flower to flower gathering pollen under its chin. The female soon chooses a flower and pierces the outer layer of the ovary of the pistil. Her eggs are deposited in this shelter and the pollen grains are rammed into the stigma. In this way the yucca is pollinated, and the hatched larvae have a ready food at hand—the yucca seeds. By the time the new moths exit, there are fewer seeds, but still enough to grow future yuccas.

The yucca, sotol and agave have been closely linked with the lives of early desert dwellers. It was the prehistoric Indian who first discovered that yucca and sotol

leaves could be used as a ready-made cleansing brush with a built-in soap. This is especially true of the soaptree yucca that in Texas is found only in the west. Multipurposed, they were also used for thread, mats, sandals, baskets, rope and in hard times to feed the livestock. It is the agave, however, that has had a more widespread but far less civilizing impact on mankind. The natural juice of the agave, when left to ferment, will produce pulque, a mildly intoxicating milky beverage popular in Mexico. When pulque is distilled, a powerful liquor—tequila—is the result. As would be expected, there are fields of agaves cultivated for just this purpose.

A tribute to the strange ways of nature, to selective adaptation and to the uses they have been put for man's needs, these plants become more than just a bush on the plains. Their silhouettes against a blazing sunset exalt the triumph of survival. \*\*



# OUTDOOR BOOKS

**GUN DIGEST TREASURY**, edited by John T. Amber; Follett Publishing Co., 20604 Collins Road, Marengo, Ill. 60152, 1972; 352 pages, \$4.95 paperback edition.

If solid gold pocket watches tucked away in trim vests, roaring fireplaces crackling on chilling autumn evenings and heavy octagonal barrels topped by pearl sights and set stylishly in engraved walnut stocks conjure up thoughts of yesteryear, then you will enjoy this treasure.

The best articles from 25 years of *Gun Digest* stir images of vintage sporting equipment and the age-old pleasures they bring.

For example, Lucian Cary's story "Forty-Rod Gun" that appeared in the April 18, 1936 *Saturday Evening Post* is about two famous gunsmiths, H. M. Pope and George Schalck. These two arch rivals and proponents of personal shooting techniques combine their strong shooting abilities to defeat "bull" guns in a forty-rod shooting match.

Jack McPhee in "Sea Otter Hunting" goes into detail about the techniques and equipment that led to the demise of these furbearers in the Washington Territory in the latter half of the 19th century.

Articles on reloading, shooting techniques and reading proof marks are as valuable now as then.

Every artist and craftsman will appreciate the well-produced photographs of the beauty of black and smokeless powder firearms.

All these articles written by masters indeed make the book a collector's item.—Darrell Holt

**GUN DIGEST**, edited by John T. Amber; Digest Books, Inc., 540 Frontage Road, Northfield, Ill. 60093, 1974; 480 pages, \$7.95 paperback edition.

For those who enjoy reading about firearms, just looking at their pictures or checking through a technical reference book, John T. Amber has provided for everyone's interest in the *Gun Digest*.

The book covers subjects from high-powered safari rifles to the basic types

of air guns, from selecting and putting chokes on shotguns to putting a choke on a Pennsylvania "Halloween Gobbler."

The articles are written by the nation's leading firearm, knife, hunting and ballistic experts. For example, in Jack O'Connor's *Forty Years with the Little 7mm*, he goes into the history, actions and hunting potential of the "sweet little cartridge."

Also, the handgunner, reloader, shotgunner and bench shooter may wish their way through the 130 pages of firearms, scopes and accessories which appear in the back of the digest.

Sectioned views of firearms, history of proof marks and ballistics on cartridges are abundant for the veteran.

This is truly an encyclopedia of shooting sports equipment.—Darrell Holt

**STECK-VAUGHN SCIENCE SERIES** by Kay L. Ware and Gertrude B. Hoffsten (Third Edition); Steck-Vaughn Co., P. O. Box 2028, Austin, Tex. 78767; 112 to 160 pages, \$1.24 each for student and teacher editions.

Designed to follow the student from the first through the eighth grade, this series is a complete science program to help the student become aware of the world that surrounds him and teach him the concepts of ecology and conservation.

Each year's WORKTEXT serves as both textbook and workbook, containing the necessary reading material as well as numerous exercises and tests so the student can apply what he has learned. Each unit in the books for grades three through eight closes with things to do, find out about and think about, which will help the teacher expand the material as desired.

The first-year science book, *Do You Know?*, touches on animals, weather, machines, health, weight and plants. Since a first-year student usually does not start out with reading skills, the first third of this exercise book requires no reading abilities. By the time this portion of the material has been covered, the student should be ready

for the remainder which is geared to the beginner's reading program.

*Things Around You*, written for grade-two students, continues where grade one leaves off to further arouse the child's interest in nature. The units in this exercise book cover insects, animals and their food, foods, magnets, the earth and sun, space, sounds, birds, weather and plants.

Grade three's book, *You Find Out*, should increase the child's understanding of his environment and covers units on living things, animals, the earth and moon, the sun and stars, weather, soil erosion, diseases, fire, machines and plants.

*The World About You*, aimed at the fourth level, contains study units centered on flowers and seeds, animals, safety, weight, the earth, electricity, light, space, needs of living things and homes of animals.

The fifth-level book, *This Earth of Ours*, adds news topics of study which include the environments, bacteria, magnetism, the solar system, the earth's movements, space travel, rocks and minerals, chemistry, matter, green plants and nongreen plants.

The ten units in the sixth-level text, *Learning to Use Science*, provide study on conservation, growth and change of animals, vertebrates and invertebrates, the blood and digestion, ecology, weather forecasting, air, sound, plants and food sources.

*Exploring Our World* builds upon basic science concepts presented at lower levels and introduces the seventh-level student to scientific attitudes of gathering, organizing and interpreting information. Material is included on animals, animal pests, work, matter and change, health, the earth, the sea, space, the universe and the fight for life.

In the final worktext in the series, *Scientific Living Today*, the student is taught the importance of science-derived technology to his life. Emphasis is placed on the controlled and unprejudiced experimentation necessary to the scientific processes. Energy sources, transportation, light, communications, safety, heredity, food supplies, community health and use of materials are covered in this study.

Any teacher at any grade level between one and eight will find this science series a valuable aid in teaching environmental education and basic science. The series has been revised and is up to date, generously illustrated, rich in activities and utilizes inexpensive equipment and materials.—Ilo Hiller

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# LONG SHOTS SHORT CASTS

compiled by Neal Cook

**Fishing Films:** A list of 109 16mm films on the subject of fishing is available on a free-loan basis to clubs, schools, churches, civic and fraternal organizations. It can be obtained by writing to Fisherman's Information Bureau, 20 North Wacker Drive, Chicago, Ill. 60606. Be sure to enclose a stamped, self-addressed envelope.

**Fish and Lightning:** When lightning hits the seawater the current is rapidly reduced since seawater is an extremely good conductor of electricity. Therefore fish that are swimming a good distance from the surface are not affected by the lightning, but those that are at the surface in the immediate path of the discharge could be killed.

**President's Awards:** The Presidential Sports Award Program sponsored by the President's Council on Physical Fitness and Sports is now available for rifle and clay target shooting. The rifle award requires a minimum of 2,500 rounds fired with no more than 50 rounds per day. Minimum target distances are 75 feet for rimfire and 100 yards for centerfire. Trap and skeet awards also require 2,500 targets over a 50-session period. After meeting the qualifying standards, shooters will receive a red, blue and gold brassard, a lapel pin and a certificate bearing the Presidents' signature and seal. For further information contact Montgomery Ward stores or write to: Presidential Sports Award, P.O. Box 129, Radio City Station, N.Y., N.Y. 10019.

**Backpacking:** A booklet, "Backpacking in the National Wilderness," written to help beginners plan a trip, is now available. The booklet suggests food and equipment, gives some good basic information and lists organizations for further information. The cost is 25 cents from the Public Documents Distribution Center, 5801 Tabor Ave., Philadelphia, Penn. 19120. Ask for S/N 0100-01282.

**Feathered Address Labels:** Research has uncovered a technique for determining the origin of geese by the minerals in their feathers. Most geese grow flight feathers while in the vicinity of their breeding grounds. As these feathers grow, minerals ingested with food and water become incorporated in the keratin of the feathers, and biologists have shown that the quantities of minerals ingested reflect the mineralogy of the local area. The origin of the birds can then be determined on the basis of mineral patterns. The technique appears to be over 90 percent accurate.

YOU'RE THE SOLUTION  
TO WATER POLLUTION

# Toothed Whales

by David J. Schmidly and Betty A. Melcher

Illustrations by C. O. Martin

Department of Wildlife and Fisheries Sciences, Texas A&M University

Contribution No. TA 10778, Texas Agricultural Experiment Station.

Part Two of a three-part series

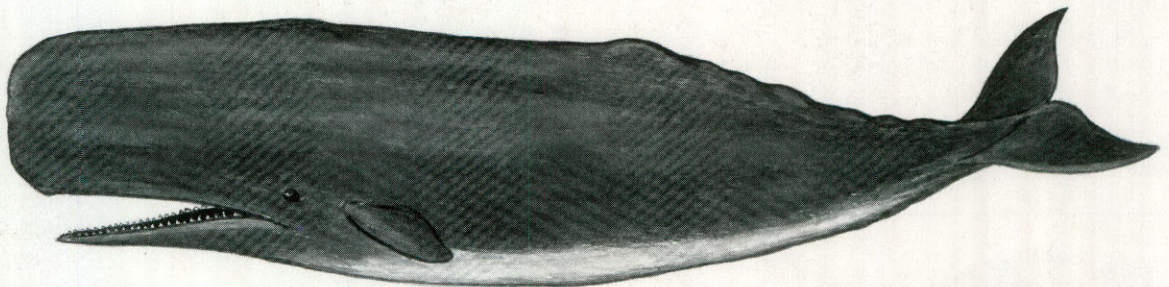
**The toothed whales** and dolphins, called odontocetes by scientists, comprise the most dominant group of cetaceans. Not only are they more numerous than baleen whales, both with respect to numbers and kinds, but they are more widely distributed. Toothed whales and dolphins are readily observed. They frequently forage close to shore, often making spectacular leaps, and they repeatedly roll out of the water. Some are prone to ride the low waves of ships much as man rides shore waves. Thirteen different kinds of odontocetes inhabit Texas coastal waters.

## SPERM WHALES

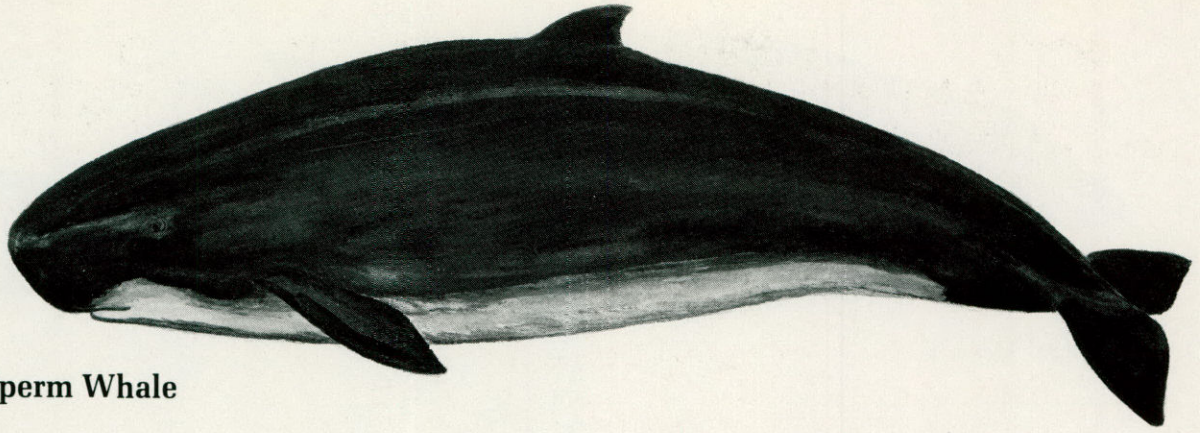
Sperm whales of the family *Physeteridae*, consist of two genera: the true sperm whales, *Physeter*, and the pygmy and dwarf sperm whales, *Kogia*. The two genera differ markedly in size and body form. In *Physeter*, the males measure from 50 to 60 feet and usually weigh from 38 to 55 tons. In *Kogia*, the length is nine to 12 feet and the weight is usually between 400 and 700 pounds. The outstanding feature of the true sperm whale is its tremendous barrel-shaped head. The pygmy sperm whale resembles a porpoise in body form, except for its underslung lower jaw which gives the animal a sharklike appearance.

Pygmy sperm whales have no economic value, but numerous commercial products are obtained from sperm whales. Sperm oil, which is associated with the spermaceti in the cavities of the head and the blubber of the sperm whale, is used as an industrial lubricant. Spermaceti, which is also present in the pygmy sperm whales, is used in making candles and ointments. It solidifies into a white wax upon exposure to air, but sperm oil remains fluid even after exposure to air and cooling. Up to 30 barrels of sperm oil and one ton of spermaceti have been obtained from the head of an individual sperm whale. Ambergris, a substance unique to *Physeter*, is used as a fixative and has the property of retaining the fragrance of perfume. It is formed from the solid wastes that coalesce around the indigestible material in the stomach of sperm whales.

**True sperm whale**, *Physeter catodon*, is better known to some as the whale in *Moby Dick*. These whales are characterized by the fact that the tip of their lower jaw terminates considerably behind the tip of the snout. Also called the cachalot, the true sperm whale inhabits all parts of the ocean between the Arctic and Antarctic circles, but the majority of them live in tropical seas. Occasionally they enter the coastal waters of Texas and one specimen was found



**Sperm Whale**



**Dwarf Sperm Whale**

stranded in the mud near Port Arthur in 1919. A second specimen beached on Padre Island in 1968.

True sperm whales are large animals and males are known to reach a length of 60 feet. Some individuals may live as long as 60 years. They are blackish brown in color with a huge head and truncate snout. Sperm whales are gregarious and some congregations contain as many as 100 individuals. Females with young calves travel together in nursery schools. One or more adult bulls, called schoolmasters, may join these groups to form harem schools.

The younger adult males often travel in loose bachelor schools. The food of sperm whales consists mostly of medium to large types of squid and octopus. Giant sperm whales are important animals in the whaling industry and more than 25,000 individuals have been killed annually in recent years from a rapidly diminishing brood stock. For this reason, this animal is in danger of becoming extinct unless effective world-wide regulations are placed on harvesting them.

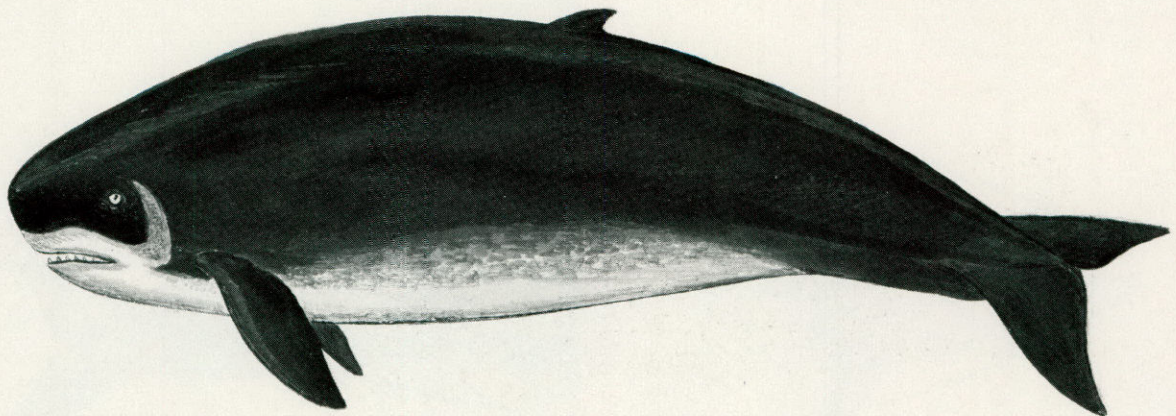
**Pygmy and dwarf sperm whales** are little known compared to their giant relative. Pygmy sperm whales, *Kogia breviceps*, attain a length of up to 12 feet and are a dark gray to black color above with a lighter underside. The dwarf sperm whale, *Kogia*

*simus*, is smaller and attains a length of only nine feet. Unlike their relatives, these smaller whales are solitary and of no commercial value. Only three records of pygmy sperm whales are available from the Texas coast: one from near Galveston, one from near Aransas Pass and one from Padre Island. All these animals washed ashore during the winter. A single dwarf sperm whale washed ashore on Galveston Island in 1968.

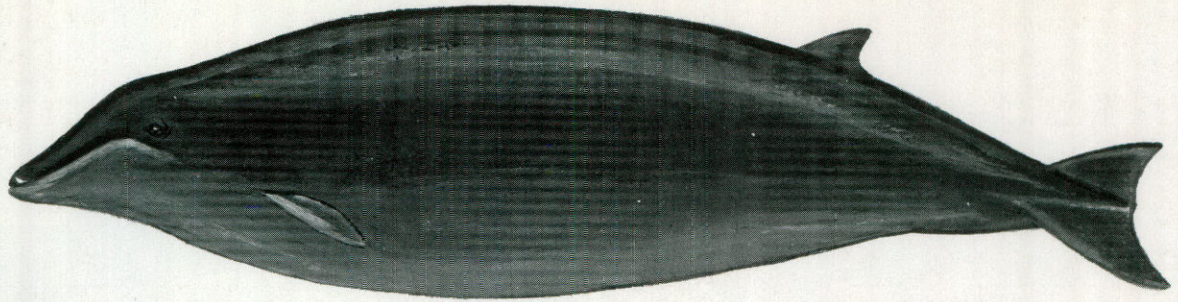
#### BEAKED WHALES

Beaked whales, of the family Ziphiidae, are among the rarest seen cetaceans in the world. This is probably due to their small size, failure to play alongside ships and lack of commercial value. Beaked whales are characterized by the presence of a small dorsal fin behind the middle of the back, tail flukes with only a shallow notch at the midline, an external groove on each side of the throat and a distinct beak which is not marked off from the forehead. They range in size from 15 to 20 feet and are generally blackish with the snout and front half of the lower jaw white.

Many beaked whales have scratches on their hides which are battle scars received during the breeding season when the males attack other males or occa-



**Pygmy Sperm Whale**



## Gulf Beaked Whale

sionally even females and young. The gestation period lasts about a year, and the calves are born from late winter to early summer. The offspring are about one-third the length of the mother. All beaked whales feed chiefly on small to medium-sized squids, but also eat deep sea fishes. The only beaked whales known from the coastal waters of Texas are the Gulf Stream beaked whale, *Mesoplodon europaeus*, and Cuvier's beaked whale, *Ziphius cavirostris*.

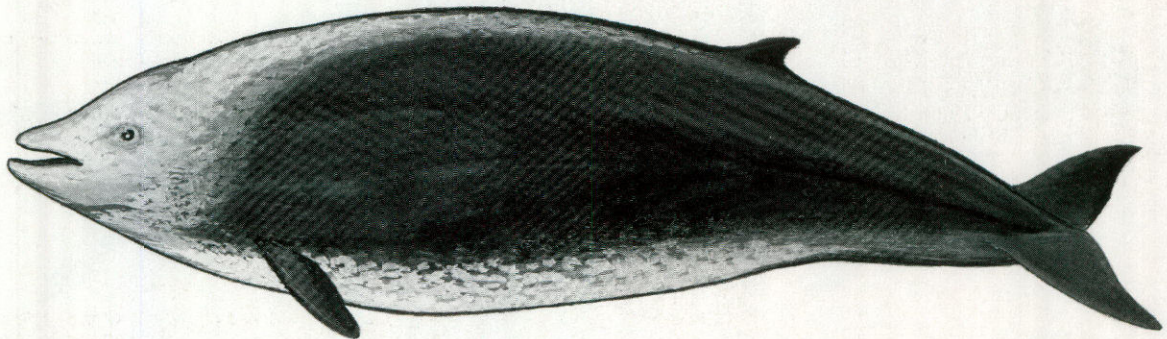
**The Gulf Stream beaked whale** inhabits the Atlantic Ocean and Gulf of Mexico. This solitary species spends most of its life far out from shore, and consequently is rarely stranded or encountered by man. A single specimen was found in Texas on Padre Island Beach in September 1946. Color is variable in these whales but is usually slaty black to bluish black above and lighter below. Only two teeth become well developed, one in each side of the lower jaw. These are much larger in the male than in the female. Virtually nothing is known of the biology of this whale.

**Cuvier's beaked whale** is the only member of this genus and is the most widely distributed member of the family, being found in the oceans of both hemispheres. Adults measure around 26 feet in length and at birth calves are about one-third the size of their mothers. Cuvier's beaked whale is unusually colored

in that its face and upper back are cream-colored while the rest of the body is very dark gray or black. Another of its distinguishing features is the presence in males of two tusklike teeth which project at the tip of the lower jaw. In females the two teeth are imbedded in the jaw bone and do not protrude. This cetacean has very short flippers and a small dorsal fin. Two throat grooves which converge in a V-shape are also prominent.

Groups of 30 to 40 Cuvier's beaked whales often travel, dive and feed together in close association. They are able to remain underwater without breathing for 30 minutes in search of their favorite food—squid. The whale is known on the Texas coast by a single specimen which stranded on Galveston's West Beach during Hurricane Carla in 1961. Its skeleton has been preserved and is on display at the Houston Museum of Natural Science. \*\*

**Editor's note:** In the January issue featuring the baleen whales, the pictures on page 15 of the finback and black right whales were reversed. The whale pictured on top of that page is the black right whale. Next month the rough-toothed dolphins and ocean dolphins will be featured.

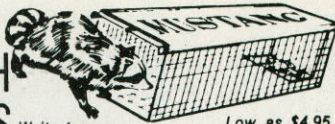


## Cuvier's Beaked Whale



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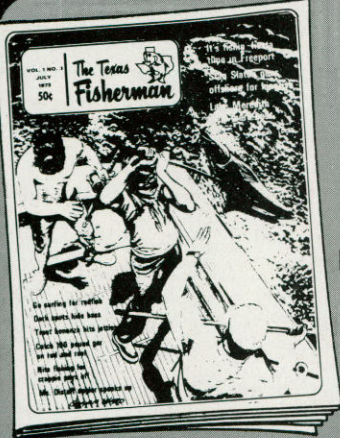
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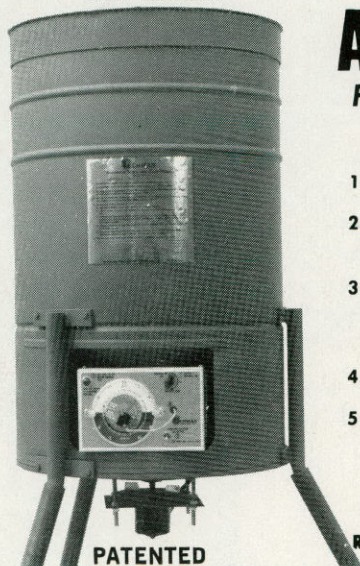
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# Pesky Plants

**Eradication of noxious aquatic plants is being accomplished within certain Texas watersheds.**

Article and photographs

by L. V. Guerra, Director Noxious Aquatic Weed Control Program, San Antonio

**Much** can be said, pro and con, about the actual value of aquatic plant life to a lake.

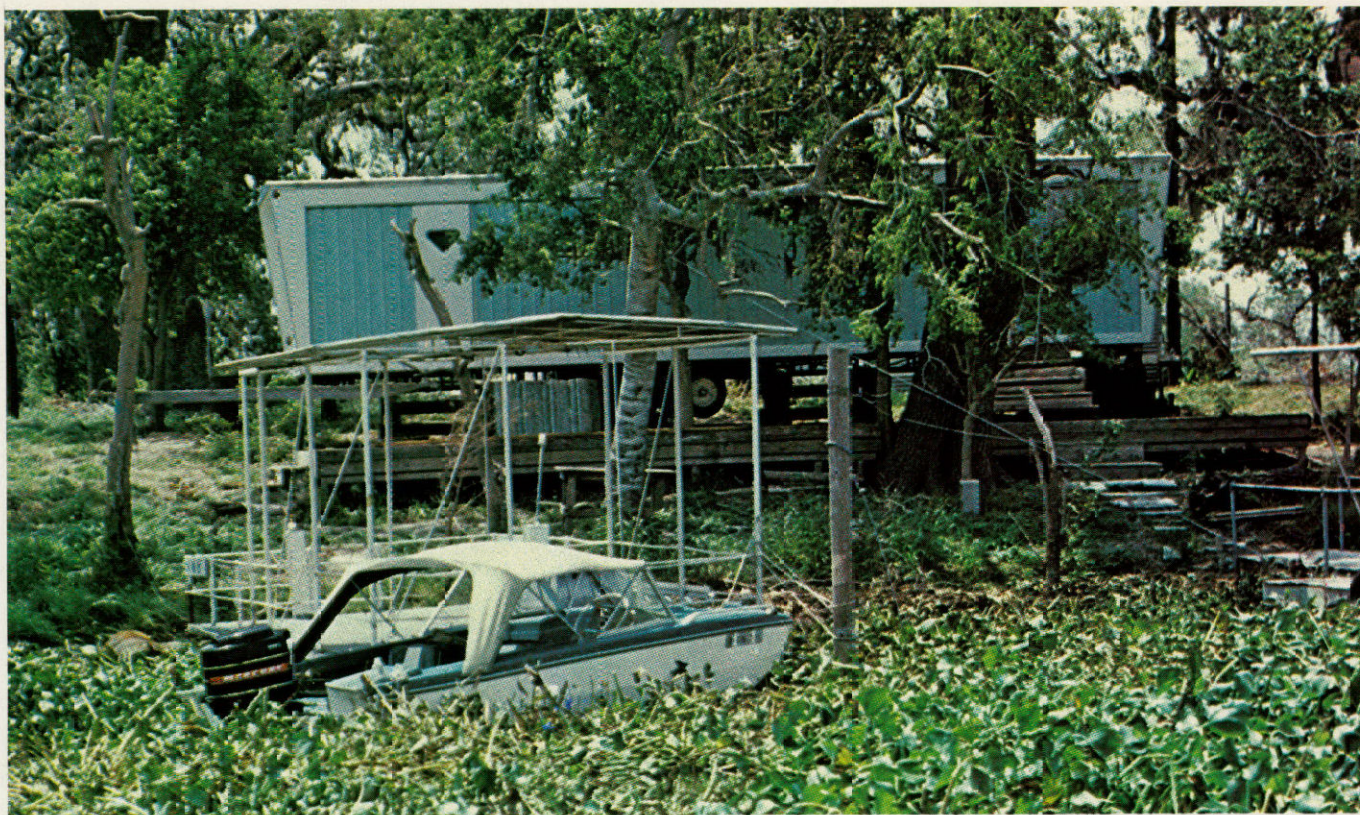
Most plants will be of some benefit to a lake if they are present only in small areas and are not too dense. Some plants provide food for waterfowl; others encourage the production of aquatic invertebrates, which serve as food for the fish. And to some extent or another, all aquatic plants act as oxygen producers maintaining an oxygen-rich environment for the fish. They also form spawning beds for the fish.

However, these good points are completely offset by the damage that some plants do because of their prolific reproduction rates and the ways they grow.

The water hyacinth is one of these aquatic pests. This plant may occur singly, in pairs, in mats or in whole rafts floating on the water. As these plants ride gently on top of the water, they are easily dispersed by the prevailing wind and wave action and tend to collect on the downwind side of the lake or drift into sloughs where they collect in rafts. This buildup in a slough or restricted area is a major problem because the plants grow and multiply and in a very short time completely cover the area, making it useless for fishing or other recreation.

Water hyacinths are also responsible for reducing or completely stopping the flow of water in small streams and drainage ditches. They greatly increase the evaporation rate of water from impoundments, and often give the water an odor and taste which is highly detectable and most undesirable.

While the water hyacinth is one of the main undesirable species, there are



several other aquatic plants which need control. The systematic eradication of all these plants within a watershed is now in progress through a cooperative program between this department and the United States Army Corps of Engineers. The main targets of this operation have been Lake Corpus Christi, the coastal areas near Port Arthur, the Guadalupe River and Lake Livingston.

To date some 25,000 acres of water hyacinths have been destroyed in the various lakes and rivers. In the lakes proper, over 20,000 acres of water have been reclaimed from this green menace.

#### Methods of Control

The program of the Texas Parks and Wildlife Department in the eradication of noxious aquatic plants has many facets and phases. It is an integrated program utilizing all acceptable and approved chemical and biological methods. At the present time, work is being restricted to combatting two major species of particularly offensive plants, the water hyacinth and alligatorweed that threaten to take over the aquatic environment.

Mechanical methods were tried in 1963 in Caddo Lake in Northeast Texas. A harvesting experiment was made to determine the possible use of the plants' fiber, protein and residue as chicken feed additives, but the high cost of purchasing and transporting the harvesting equipment, long hauling of harvested

plants and loss of xanthophyl content of plant residue in drying made the operation expensive and unfeasible. From a control point of view the plants grew back to their original size in an average of 43 days.

In the chemical phase, the department is using acceptable liquids and granules, 2,4-D and 2,4 Dichlorophenoxy acetic acid butoxyethanol ester (2,4-D B.E.E.), that have been cleared for use in drinking waters. The latter chemical is a specifically formulated material that has been cleared for use in drinking waters by the United States Departments of Agriculture; Health, Education and Welfare; Department of Health; and the Environmental Protection Agency; as well as the Texas State Department of Health. Although the ester formulation of 2,4-D is more expensive than the formerly used amine formulations that did not have clearance for use in possible drinking water supplies, the higher price of this newer, rapidly bio-degradable material should not be of major importance when human health and welfare are being considered.

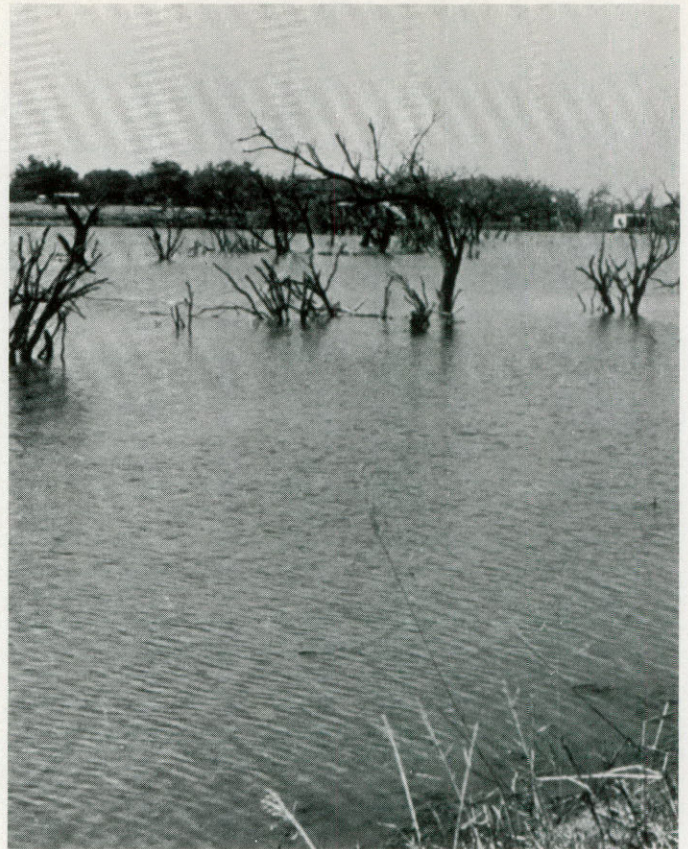
Use of these chemicals in liquid form has produced the most dramatic results. Many areas that were completely useless have been restored to use. Areas precluding boat traffic, fishing and water skiing have been opened up and in many areas even swimming beaches have been cleared.

Granulated herbicides have been tried in several places. Caddo Lake was first treated with 28,000 pounds of 2,4-D B.E.E. at the rate of 40 pounds of active ingredients per acre (a.i./ac.) with very satisfactory results.

Granulated 2,4-D B.E.E. (Aqua Kleen 20) was used on the main boat roads. These roads are normally closed from June until the first severe frost in the winter with yellow water lilies and white water lilies or spatterdock and submerged vegetation such as milfoil, bladderwort, coontail and elodea. During the growing season, these submerged plants grow from the bottom all the way to the surface, anywhere from five to 11 feet in depth. Traveling over the most picturesque parts of Caddo Lake during the plants' growing season is almost impossible. Marinas are closed, fishing camps suffer financial losses and the general public seek their pleasure elsewhere. In reality, everyone suffers.

The chemical was distributed with a motorized seed spreader regulated to spread a path 32 feet wide. The treatment rate of total material was established at 200 pounds per acre. Maximum release of material occurred in 21 days and the results on broad-leafed plants was very satisfactory.

Certain plants in the boat roads and state park area have a natural partial resistance to 2,4-D B.E.E. and did not succumb to the treatment. These plants



were treated with copper sulfate at the rate of eight pounds per acre, and the subsequent results were excellent.

A second application was made with Aqua Kleen 20 at 50 pounds a.i./ac. in certain areas and the results were very satisfactory. These areas were subject to flooding, high turbidity and a "flushing effect" from heavy currents. The gradual plant breakdown and the resultant partial fertilization improved fishing.

In the biological phase, we are using flea beetles, *Agasicles sp.*, on alligatorweed and a weevil, *Neochetina eichhorniae*, on the water hyacinth. Shortly, we will be working with a new species of water hyacinth weevil, or beetle as we prefer to call it, *Neochetina bruchi*.

The adult flea beetles currently being used on alligatorweed eat the leaves of the plant. The adults lay their eggs in the stems, and when the larvae hatch, they tunnel through the stems, feeding as they go. In late summer when the plant stems dry and the adults can no longer penetrate them to lay their eggs, an application of the chemical 2,4-D B.E.E. is applied to defoliate the older growth. This allows the newer succulent alligatorweed leaves to emerge and provides a place for the flea beetles to lay eggs which will winter-over for the next growing season and provide adult beetles to keep the cycle going.

The water hyacinth adult weevil

feeds on the top, waxy cover of this plant's leaves. These blotchy feeding areas starve the leaf causing it to rot and also make the plant susceptible to bacterial and fungal decay. The larvae form of this weevil also feeds and tunnels in the stems of the plant.

Past experiences with wintering-over of our insects has taught us to move them farther south. This year they will be introduced in South Texas near Brownsville and Del Rio, and we hope to establish permanent colonies in these areas so they can be used as brood stock.

#### Benefits of the Program

The removal of approximately 25,000 acres of water hyacinths from Lake Corpus Christi has made some 20,000 acres of previously plant-covered water available for recreational uses. Some 1,000 fishermen now have an opportunity to fish the area either with trotlines or rods and reels. Fishermen spend approximately \$15 per day, and if 200 days of the year are used for fishing, the economic impact of this area would amount to \$3 million per year. Recreational value to sightseers amounts to 50 cents per day for 160,000 days for a value of approximately \$80,000. This newly-created space also provides duck hunting for an additional 1,500 man-days with a seasonal revenue of some \$15,000. Sightseers and birders bring in a recreational revenue of approximate-

ly \$12,500 per year, and the additional park usage of Lake Corpus Christi State Recreation Park equals this amount. The total yearly recreational benefits to the concerned area amounts to about \$3,107,500.

Once the plants are removed and the shoreline of the lake can be seen and utilized, the monetary value of the land increases. It has been estimated that land values around Lake Corpus Christi have increased by at least \$100 per acre since the removal of the water hyacinths. On the basis of 160 acres to the mile of shoreline, with 200 miles of shoreline, this would equal a total appreciation of land values of some \$3,200,000, and this is for only one 22,000-acre lake.

One very detrimental factor of aquatic plants, especially water hyacinths, is the tremendous amount of water they use through the physiological process of "trans-evaporation." The plants' increased usage of water is seldom considered, but one acre of water hyacinths will evaporate water 3.3 times faster than water without plants. Normal water evaporation rates are five feet per year, but the evaporation rate of water hyacinths is 16.5 feet per year, a difference of some 11.5 feet per year.

The removal of 8,000 acres of plants has saved some 920,000 acre feet of water from Lake Corpus Christi, which



Whether biologists spray the offensive aquatic plants with chemicals (left) or release flea beetles (as shown in hand below) to feed on them, the results of both the chemical and biological programs are easily seen in the before and after illustrations on the opposite page.

equals over 26 billion gallons of water. This is approximately enough water to furnish 108,900 households with 20,000 gallons of water per month for one year. If the average water rate per household is \$50 per year, this would amount to \$5,445,000. Assuming that water treatment and purification is 75 percent of the cost, this would represent a savings of \$1,361,125 in this one lake.

There are other benefits that have not had a dollar and cents value placed on them such as the removal of the breeding grounds for mosquitoes and other disease-carrying insects.

#### **The Future**

Because of the satisfactory results of previous efforts, the department is getting ready to undertake the problems of water hyacinths on Lake Rayburn, the alligatorweed on Dam "B" and possibly milfoil on Somerville Reservoir. All efforts will incorporate an integrated control program of chemical and biological methods. We hope to remedy or at least alleviate the problem soon.

Five watersheds out of seven are now under a minimal maintenance program. Inroads are being made on others, and the future with the Corps of Engineers' help looks promising.

It is our singular purpose to eliminate noxious aquatic plants wherever they occur and return a portion of the aquatic environment made unavailable into one for recreation and enjoyment. \*\*



# Recognition for Your Trophy Fish

by David Baxter

**Every sportsman** enjoys recognition for outstanding scores, records or feats of prowess within his sport, and fishermen are no exception.

Parks and Wildlife Department inland and coastal fisheries biologists are happy to do a little back-patting in return for some important information from Texas fishermen. As of the first of this year, the department kicked off a new Fish Award Program which will recognize every fisherman in the state who catches a trophy among some 14 species of saltwater and freshwater fish.

Not to be confused with the Parks and Wildlife Department's "Texas State Fish Records" which single out only the biggest of saltwater and freshwater fish, the new award program is designed to recognize everyone who catches, for instance, a largemouth bass over eight pounds. The department wants to hear about all large fish, not just the ones which break existing records.

In return, the fisheries biologists will obtain some insights into the conditions of Texas' bays, lakes and rivers. The fish experts are out to find which bodies of water in Texas consistently produce large fish.

Bays and lakes yielding large fish are usually healthy bodies of water which receive the proper amount of fishing pressure and have proper water conditions and habitat. The first indication of something wrong is the lack of big fish.

By identifying productive waters, fisheries biologists will have still another tool to help make all of Texas' lakes and bays equally as productive.

Here are the rules of the new program:

—All fish entered must be taken by pole and line in Texas waters after January 1, 1974.

—The entrant must have hooked, fought and landed the fish.

—All fish entered must be measured for total length and weighed on an inspected scale certified for trade by the Texas Department of Agriculture. A statement of weight signed by a witness must also accompany the application. A photo of the fish is not necessary to be awarded a Certificate of Fishing Merit, but remains a criterion for record breakers in the "Texas State Fish Records."

The date of catch, place of catch and type of tackle are also included on the application.

Application forms for submitting entries in the new fishing award program are available at all Parks and Wildlife Department offices and from bonded license deputies wherever hunting and fishing licenses are sold.

Minimum weights on three of the fish—walleye, striped bass and rainbow trout—are subject to being raised in the future as the introduced populations of these fish get older and larger. Already, the 12-pound minimum on walleye is more than the existing state record of eight pounds, 14 ounces for this fish, but this record should be broken before long.

Only the following species of fish weighing more than the listed minimum weights will be considered for a Certificate of Fishing Merit:

Spotted sea trout (speckled trout)	7 pounds
Redfish (from the Gulf of Mexico)	25 pounds
Redfish (from bays)	14 pounds
Black drum	35 pounds
Southern flounder	6 pounds
Largemouth bass	8 pounds
Crappie (black & white)	3 pounds, 8 ounces
White bass	4 pounds
Channel catfish	15 pounds
Blue catfish	40 pounds
Flathead catfish	60 pounds
Walleye	12 pounds
Striped bass	20 pounds
Rainbow trout	2 pounds

Parks and Wildlife Department officials are making a distinction between Gulf and bay redfish because the fish usually leave the bays after they reach a certain size.

Even though trotlines might account for some large fish, notably catfish and redfish, the awards program is limited to pole and line fishermen to keep it aimed at the majority of sport anglers.

If you catch a fish you're proud of, better check the list and then get an application form for the Parks and Wildlife Department's Certificate of Fishing Merit. You'll be getting the recognition you deserve while helping fishing across Texas. \*\*



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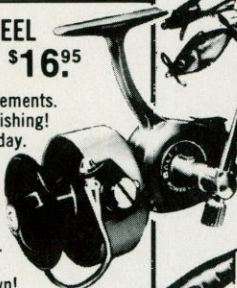
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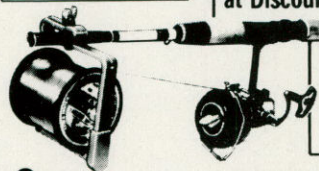
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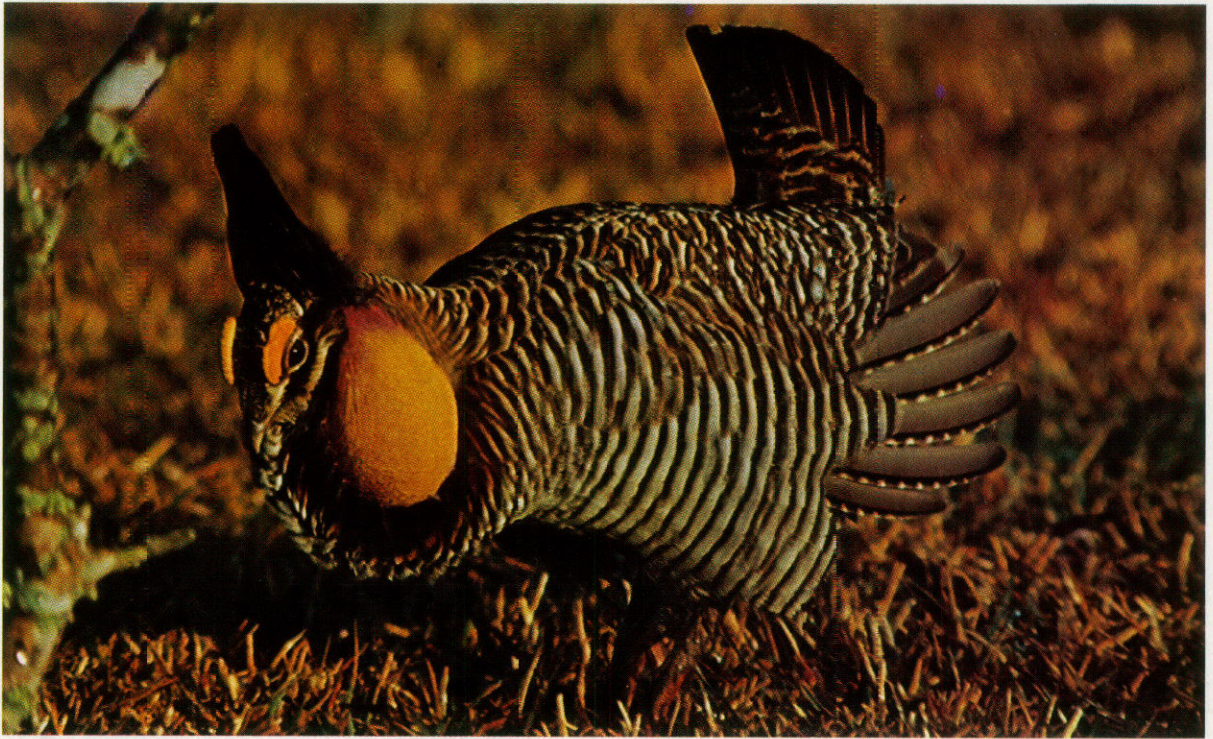
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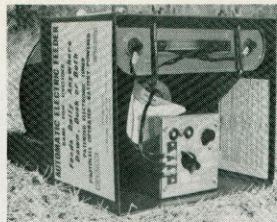
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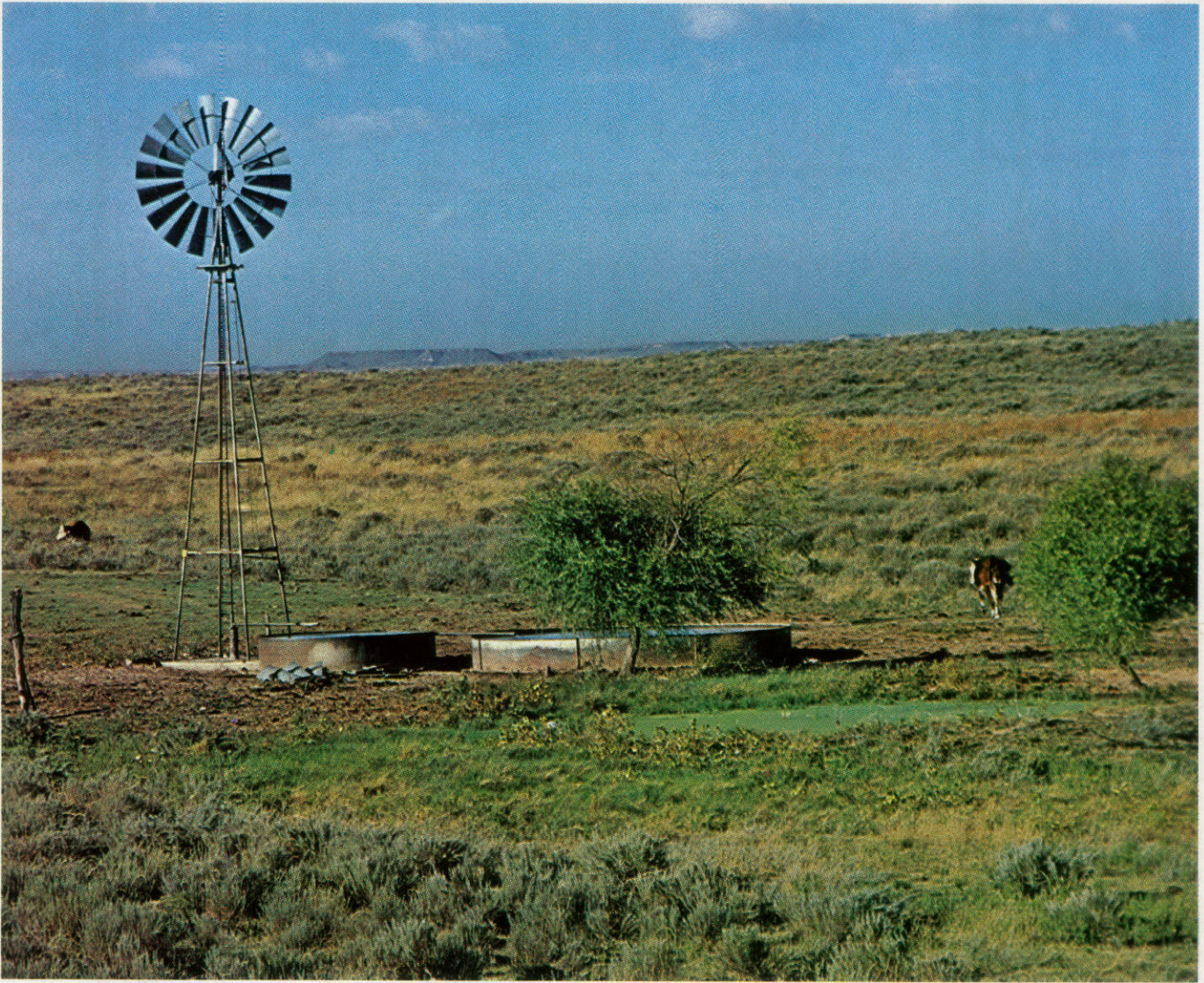
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# PANHANDLE PROVING GROUNDS

Techniques and procedures for the compatible management of both wildlife and livestock are being studied in this area.

by Vernon B. Morse Wildlife Biologist, Canadian

**The name** of the Anvil Park Ranch and Rodeo brings back a lot of memories to old-timers in the Northeast Texas Panhandle because it was here that cowboys first competed for a cash purse on a professional level.

But the rodeo cowboys' yells and the applause of the crowds have faded into the past since the ranch was converted into a department wildlife management area during 1950. Today the area is used to study and develop procedures and techniques of game production.

Originally named the Studer Wildlife Management Area, it was renamed in 1952 in honor of the late Gene Howe, longtime Commissioner of the Game and Fish Commission. Located in Hemphill County, approximately seven miles northeast of Canadian on Ranch Road 2266, the Gene Howe Wildlife Management Area contains 5,800 acres of land bordered on the south by the Canadian River and rising northward into rolling sandhills. The Canadian riverbottom, once said to contain the



*Landscape varies from the rolling sandhills (extreme left) to riverbottom containing swampland surrounded by rich alluvial flats and natural meadows. Patterns of wood trees (left) are planted to develop deer, turkey, quail and pheasant habitat.*

"quickest sand in the West," is made up of several swamps surrounded by rich alluvial flats and natural meadows, providing ideal homes for numerous white-tailed deer, wild turkey, prairie chicken, coyote, bobcats, raccoon, opossum, beaver, an occasional ring-necked pheasant and squirrel.

Vegetation in the riverbottom consists primarily of thickets of Eastern cottonwood trees with an abundance of button bush, sandbar willow, salt cedar, common persimmon, black locust and generous portions of poison ivy. The observing visitor to this portion of the area will find surprisingly dense stands of unusual plants such as hibiscus, prairie cordgrass, eastern gramagrass and, occasionally, some wild pokeberry.

The land inclines gently northward through a transition zone which is extremely rich in plant and animal life common to both the riverbottom and the sandhills of the northern portion of the management area. The sandhills

comprise about half the total acreage on the area and are primarily grassland with sandsage interspersed with motts of fragrant sumac and Chickasaw plum.

When first purchased, all of the area was a typical example of grossly overgrazed rangeland, so domestic livestock were excluded for almost nine years. This provided an excellent opportunity for studying the natural changes which occur in the plant community as it improves toward the highest possible production of vegetation. It also afforded a ready-made chance to measure the effects of each successive stage of development on various game birds and animals, principally quail.

The bobwhite quail was considered the most important game species on the area and still receives the greatest management and research efforts from area personnel.

A long-term grazing lease with private beef producers was begun in 1959 for a three-fold purpose. First, continued exclusion of livestock would result

in a typical vegetative community on the area. Second, taste preferences and nutritional differences between plants cause livestock to graze some plants more heavily than others. This upsets the natural ratio of plant species and often benefits some game animals. Third, it would provide needed data on the economics of a ranching program in relation to game management practices. Livestock numbers are changed in relation to the increasing forage production and according to needs of the research program in progress.

The lease agreement based on competitive bids gives complete control of the grazing program to department personnel, but provides safeguards needed by the livestock owner. The lessee makes an annual payment for grazing privileges, based on the number of cows on the area for that year. Data obtained from the grazing lease includes the numbers of calves, their weights, selling prices, death loss and costs of labor, feeds and transportation. This information is integrated into the overall research program.

An intensive vegetative census is conducted on the area each year to measure the vegetation resulting from various intensities of grazing, land-management practices and fluctuating rainfall. This data is compared to similar information from previous work, the profit-loss economics of the grazing program, game species census data and food habit studies of game harvested on the area.

Several studies have been conducted in the sandhill pastures. One of these was an attempt to produce woody cover on the uphill side of small "push-up"-type earthen dams. Another study determined the effect of various rates of grazing in the plant community, quail food habits and quail populations.

One current research job being carried out in a sandhill pasture is designed to study the effects on quail numbers and food habits of commercially produced quail food blocks. This study may provide methods of utilizing large areas of land that have adequate cover but lack essential forbs for producing sufficient amounts of food.

Another research job currently being



*In addition to the dyed quail program which helps biologists keep track of this hard-to-locate species for management studies, an intensive vegetation census is made each year on the area to determine the compatibility of the food demands for livestock and game species.*

carried out involves a study to determine the effects of various degrees and patterns of brush removal on quail and prairie chicken populations. The normal method of accomplishing brush removal is to use an aerial application of a hormone which kills most broad-leaf plants. Several years are required for most brushy plants to deteriorate to the point that the brush is not a dependable escape cover for quail.

To avoid the several-year waiting period, one pasture of over 900 acres was mowed with a brush beater to remove all above-ground woody growth. This same pasture later received complete treatment by aerial application of 2,4-D to kill most of the woody plants. For comparison, an adjoining pasture of similar size was treated in strips, 800 feet wide at 950-foot intervals, with the same hormone mixture. Information collected in these two pastures will be compared to similar information collected from a third adjoining pasture where no brush removal work is planned.

Data obtained from this study, complemented by additional information on brush removal from other wildlife management areas, should provide valuable data on various patterns and degrees of brush control and how each affects the game species involved. Hopefully, this will be an alternative, as well as an incentive, to avoid the wholesale-type habitat destruction that is generally being carried out in Texas.

For many years, trapping and banding activities have been carried out on the Gene Howe Wildlife Management Area to trace the movements of quail coveys and individual birds. Band returns from this effort have been relatively few. In recent years, the technique of color-marking quail with aniline dye has been used. This involves the usual trapping and banding procedures, but in addition, each quail is dipped in a container of dye diluted in ethyl alcohol which produces some brilliant and unusual colors for quail. The dyed quail generate a lot of conversation, provide more information on time and distance traveled in a given interval and indicate preferences for various habitat components. Although most of the marked bobwhites are harvested in the same pasture where they were banded, they frequently travel three to five miles, and distances of 10 to 15 miles are not uncommon.

Quail populations on the area are censused by using a combination of different techniques. The daylight covey-call count is used by biologists to count the numbers of coveys that call

at first break of day. A bird dog is used to obtain a covey count in some pastures and also to provide a means of counting the number of quail in each covey located. The numbers of hunting permits are determined from the census information.

Public quail hunts are conducted almost annually with permits which are issued through an impartial drawing. These hunts are of value as a research tool. They provide data such as percent of hunting permits used, number of quail bagged and hours hunted per person, sex and age ratios, weight and food habits. Relative hunting success from the various experimental pastures is used to evaluate management procedures.

For example, during the last five years, 468 people participated in public hunts on the Gene Howe Area and harvested 2,182 quail, 45 deer and 17 turkeys. That number of hunters was considered sufficient to gather the needed research data. The average hunter spends approximately 10 hours actually hunting and bags an average of seven quail. The figures on annual bobwhite harvests are testimonial to the practicality of quail management.

Another study that is underway is designed to provide data to aid hunters

or landowners who would like to establish or rebuild quail cover on sandhill ranges. Tests are being conducted to determine the feasibility of transplanting native plum and sumac and planting other species of barerooted nursery seedlings. This study will also provide a demonstration area such as is now available along the riverbottom.

Approximately 16 species of woody plants consisting of 22 miles of rows were planted along the riverbottom during the mid-1950's. Russian olive is the only species that survived to any appreciable extent, but it has produced very effective cover. One pasture alone, with Russian olive established and large enough to be effective cover, has increased the winter quail population of from near zero to just less than one quail per acre—a good population of birds per pasture.

The Russian olive lanes and clumps planted in the large hay meadow now consistently harbor a herd of 30 to 50 white-tailed deer, not counting the deer that use nearby native brush. Quite probably the fruit of the Russian olive is also a contributing factor in maintaining the population of ring-necked pheasant along the riverfront.

A riverbottom brush-clearing opera-

tion begun in the late 1950's was later expanded to include additional revegetated acreages. This land was cleared by mechanical means leaving strips and blocks of native brush and individual trees to demonstrate practices that could create a desirable wildlife habitat where once only riverwash sand was found. This idea was accepted and expanded by other government agencies and private landowners into a riverbottom reclamation project. Some good work has been done on fertilization and adapting grasses for reclaiming the bottoms. This may eventually help build a better wildlife habitat as well as boost private beef-producing enterprises.

The Gene Howe Area and other wildlife management areas were purchased for the primary purpose of conducting wildlife research. The practices that prove worthwhile examples of wildlife management are put to use for demonstration purposes. Interested persons are encouraged to visit the area at any time for information on procedures of installation, time elements, costs and probable benefits to a given species.

A profitable livestock and farming operation can and should also include a profitable wildlife program. \*\*



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# Young Naturalist

## Plant Galls

by Ilo Hiller

An intriguing world of plant galls is all around us, but many of us have probably never seen a gall or known what it was if it was noticed.

The gall is an example of a plant-animal relationship, but the plant is an unwilling and helpless partner in the relationship. Over 2,000 types of beetles, moths, aphids, flies and wasps, as well as mites (not insects), nematodes (parasitic worms), fungi and bacteria can cause abnormal growths which may be found on any part of a plant—buds, leaves, flowers, twigs, under the bark and even on the roots.

Insect galls vary in size from about two inches to less than one-sixteenth of an inch in diameter, with some being little more than slightly thickened areas on leaves. They come in almost any shape—perfectly round, oblong, egg-shaped, spindle-shaped, bottle-shaped or obviously abnormal, ugly, cancerlike growths. Some look like pine cones, but they form on the willow and are caused by a gall fly. Others, like those formed on the cypress by a tiny gall gnat, resemble flowers and could be mistaken for small yellowish blossoms. Gall gnats may also produce structures on leaves which look like buttons, tiny duncap caps or pointed tubes or columns. The spiny rose gall, caused by a gall wasp, is round but its surface is covered with sharp spines in pastel shades of pink and yellow.

Beautiful or ugly, large or small, the gall is completely made up of plant tissue; and it is the insect and its particular chemicals which control the form and shape in which the gall grows.

Usually the adult female of the gall-making creature selects a plant during the spring or early summer while the plant is still actively growing and inserts her ovipositor (egg-laying organ) into a tender growing part. When she deposits her egg or eggs, she also injects a chemical which causes the gall to begin forming. When the egg hatches, the larva continues to release a chemical which keeps the gall growing to match the size of the larva.

Little is known about the chemical nature of the

gall-producing secretion, but it is a complex substance which is rich in nucleic acid and protein. Nucleic acid is the substance which passes hereditary characteristics from one generation to the next and influences growth. Since irregular cell division occurs in both plant galls and cancerous growths in animals, there are some research workers who believe that there may be a close relationship between the chemicals found in the two.

Selection of the plant for egg laying by gall makers is not always limited to a specific type of plant, but some do show preferences. If one species of insect selects several different kinds of plants in which to lay its eggs, each plant will produce very similar galls. However, if several different species of gall makers select the same plant, they will cause it to produce galls that are quite different from each other.

There are two main types of galls—closed and open. Insects such as wasps, moths and flies which have chewing mouthparts in their adult or larval stages are usually found in completely closed galls. When the time arrives to emerge, the adult chews its way out or exits through an opening made by the larval stage.

Insects with sucking mouthparts must use partially open galls or galls that open for them when it is time to emerge. The aphid is one of the latter type. Its marble-sized gall forms on the leaf stem of the cottonwood tree. The gall is thin-walled, but within its structure a whole colony of aphids develops. At the proper time, a slit appears on one side of the gall and the lips of the slit open to allow the aphids to escape.

In addition to the growth-stimulating chemicals, many insects produce an enzyme which is able to change the plant's starch into sugar causing some galls to accumulate large amounts of it. Scrub oak and shin oak galls found in the Southwest contain so much sugar that it oozes out in liquid form onto their outer surfaces. This gall nectar or honeydew is gathered and stored by honey ants.

The honey ants, which are unable to make wax storage cells as bees do, use sterile female ants as living storage tanks to hold the honeydew to feed the rest of the ant colony during times when honeydew is not available. These females, which are fed to the bursting point by their fellow workers, are able to hold about eight times their weight in liquid honeydew in their elastic abdomens. Once they become too full to move, they hang themselves from the ceiling of the ant nest like small grape clusters, supported by tiny claws on their feet. When food is no longer available, a hungry worker approaches a storage-tank female, places its mouth against hers and a droplet of honeydew passes between them.

In one section of California, the galls formed on oaks by a certain type of gall wasp produce so much honeydew that honeybees in the area gather it and may store as much as 30 or 40 pounds of it in each hive.

Galls also contain large amounts of tannic acid which is widely used in the manufacture of medicines,



insecticides and permanent inks. The Aleppo oak gall of Asia Minor which is produced by a cynipid wasp contains about 65 percent tannic acid, and for centuries the best permanent inks were made from these galls. As far back as the 9th and 10th centuries, monks used inks made from a formula containing the tannic acid of the Aleppo gall to record their manuscripts. The United States Treasury, the Bank of England and other foreign governments have also specified that permanent inks produced from the Aleppo galls be used when printing their money and when writing important documents. However, synthetic chemicals have largely replaced galls in the manufacture of inks for most purposes.

Extracts from galls have also been used throughout the world for making dyes. A scarlet dye called Turkey red is obtained from the "mad apple" gall and is widely used in Asia Minor in the dyeing of rugs and fabrics.

Although they are rich in nutritional value, the high tannic acid content of the galls make them unsuitable for humans to eat; however, in Missouri and Arkansas a particular species of oak gall falls from the trees in the autumn and is gathered for livestock feed.

Most gall makers are harmless to their plant hosts except for deforming and spoiling their appearance, and many galls are useful; however, there are some gall makers which are considered serious pests to farmers.

One of these is the larval stage of a gall fly, known as the wheat jointworm, which attacks the wheat stems forming galls just above the first joint, weakening the stems and reducing the wheat yield. Others are the clover leaf midge which attacks the clover blossoms in such numbers as to prevent seed production and a grape aphid which almost ruined the French grape vineyards.

This grape aphid appeared in France around 1860, and during the next 25 years it destroyed more than 2½ million acres of grape vines. The first generation of this type of aphid covered the grape leaves with tiny galls which made the leaves yellow and wither, but the second generation attacked the roots forming galls which caused the vines to rot. Since roots of American grapes were highly resistant to this destructive aphid, they were planted in French vineyards and the French grape varieties grafted to them. Since the quality of the fruit is determined by the charac-



teristics of the leaf and stem system, the French grapes retained their own qualities and were not changed by the American root systems.

Whether useful or harmful, the gall insect has its own natural enemies to help keep its numbers under control. Since the gall is so obvious and unable to move, it is a sitting duck for any parasite or predator looking for a meal. Parasites of all types are able to penetrate the gall case and eat the defenseless larva inside. Predators such as birds, mice and squirrels tear open the gall to reach the tasty insect or larva within; and there are some fishermen who use the larva found inside the goldenrod gall for fish bait.

Other creatures known to scientists as inquilines (animals which live in the nests or abodes of other species), enter the gall to share the larva's food supply. These inquilines may take so much nourishment from the plant gall that the original gall resident dies of starvation.

Once the gall insect emerges naturally or becomes a meal for another creature, the empty gall still has its uses as it provides a winter shelter for other insects. For example, the cavity in the goldenrod gall is used as a nursery by a certain type of wasp. This

little wasp lays her egg in the gall, puts food in it and then plugs the old exit hole with a mud stopper.

Midges, aphids, plant bugs, flea beetles, springtails, thrips, mites and spiders often take refuge in willow pine cone galls. In fact, one study of such a gall revealed that there were 31 different species of insects within the gall—10 inquilines, 16 parasites and five transients (insects just passing through).

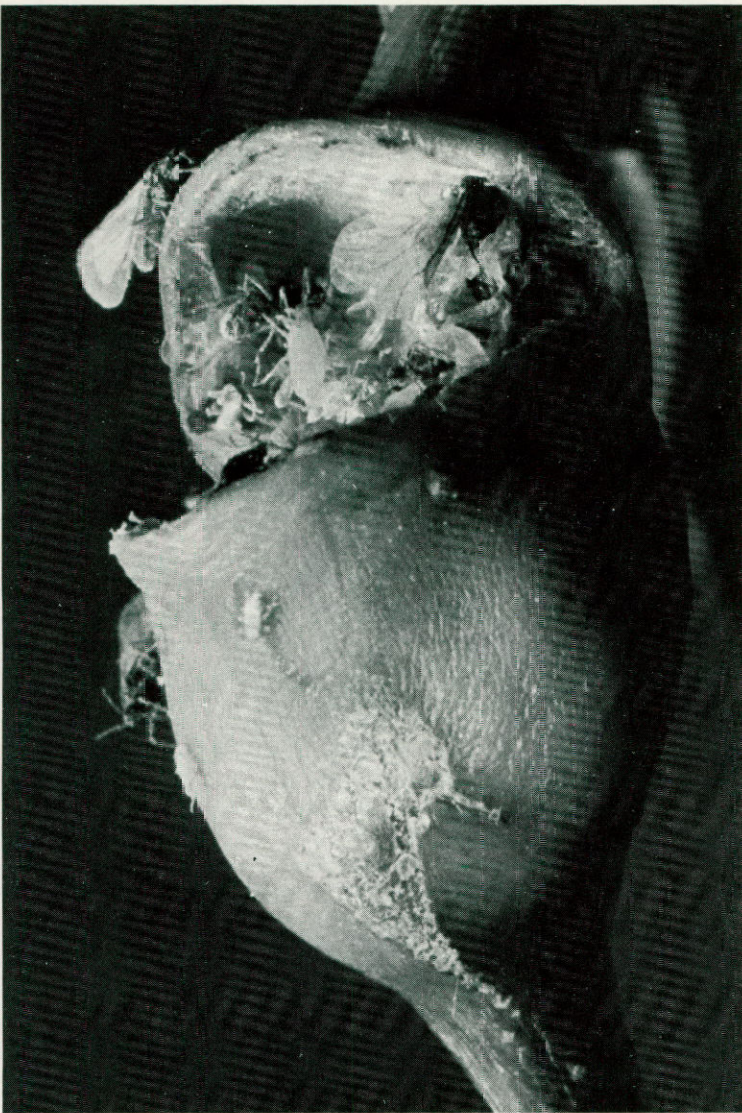
Empty or full, galls are interesting oddities of nature which should offer unlimited opportunities for investigation and discovery to the young naturalist.

Fortunately, galls are easy to keep indoors. Just place some damp soil in a large-mouthed gallon jar and stick the stem with the gall on it into the dirt. Cover the top of the jar with cheesecloth or part of a nylon hose to prevent the escape of the insect when it emerges from the gall.

Do not place the jar where it will receive direct sunlight or heat and be sure the soil stays moist or the gall will dry out and the insect will die.

If you collect more than one type of gall, place each different gall in a separate jar or you will not be able to tell which insect emerged from which gall.

Good luck as you enter the world of plant galls. \*\*



*Some insects can cause plants to form plant-tissue homes for their eggs and young. These homes, called galls, may look quite different—fuzzy clumps or hard balls on leaves and stems or growths with tightly closed slits which open to allow the hatched insects to emerge as in the aphid gall (black and white photo).*





# LETTERS TO THE EDITOR

## Hunter Safety Course

I have a 12-year-old son very interested in hunting and I feel he needs to be educated in the handling and firing of a gun before he attempts to use one. Can you give me any information that will be of help to him?

Mamie Allen  
Alta Loma

**We have a Hunter Safety course which is taught by volunteer instructors throughout our state for boys and girls who are at least 12 years of age.**

**We suggest that you contact your district law enforcement office or your local game warden concerning when and where a course is to be taught in your area.**

**All that is required is a \$1 registration fee for a course of at least six hours which is set at the discretion of the instructor. When a student has satisfactorily completed the course, he is issued a Hunter Safety Certificate. This is a permanent record and is honored in other states which require a Hunter**

**Safety Training Course as a prerequisite to purchasing hunting licenses.**

## Rough-to-Game Fish Ratio

I recently read the piscatorial population of Lake Travis was once estimated at something like 30 percent game fish and 70 percent rough fish. The author of that statement hinted that was not a desirable condition. I was just wondering what biologists consider the ideal game fish-to-rough fish ratio?

C. J. Johnson  
Austin

Biologists use the total rough fish-to-game fish ratio only as an index to general population condition, and they consider an ideal ratio as one which produces the highest level of sport fish harvest. Some rough fish occupy an important ecological niche and are very valuable as a source of food for game fish species.

The ideal rough fish-to-game fish ratio depends on the size of the different species of fish present. As an

illustration of this, consider whether it would be better to have 1,000 shad weighing one pound each or 10,000 shad weighing one-tenth pound each. The total weight of shad would be the same, but the smaller shad would be good forage for game fish and thus beneficial, while the larger shad would not be useful as forage and thus would be problematical.

To illustrate the importance of species composition, consider whether it would be better to have rough fish that are large bottom feeders (carp, buffalo-fish, etc.) which destroy game fish nests and cause water to be muddy; or would it be better to have small open water rough fish which feed on plankton and which do not disturb game fish nests and cause muddy water? Obviously the latter would be best.

Thus, game fish-to-rough fish ratios are meaningful only when the species' composition and sizes of fish are considered.

## Quail Mortality

Is it true that bobwhite quail populations undergo an annual 75 to 80 percent mortality rate whether or not the bird is hunted?

W. H. Porter  
Austin

**Yes, there is approximately an 80 percent annual turnover in bobwhite quail populations, whether they are hunted or not. This has been documented through population and wing studies. Causes for such a high mortality rate are natural predation, disease, malnutrition, adverse weather and other mortality factors.**

## BACK COVER

Whether at a field trial or on a regular bird hunt, watching a dog flush a covey of quail is a pleasurable experience. This English setter is just one of six or seven breeds used to hunt quail in Texas; and bird dog owners never miss a chance to get out and follow their dogs either on foot or horseback. Photo by Bill Reaves.

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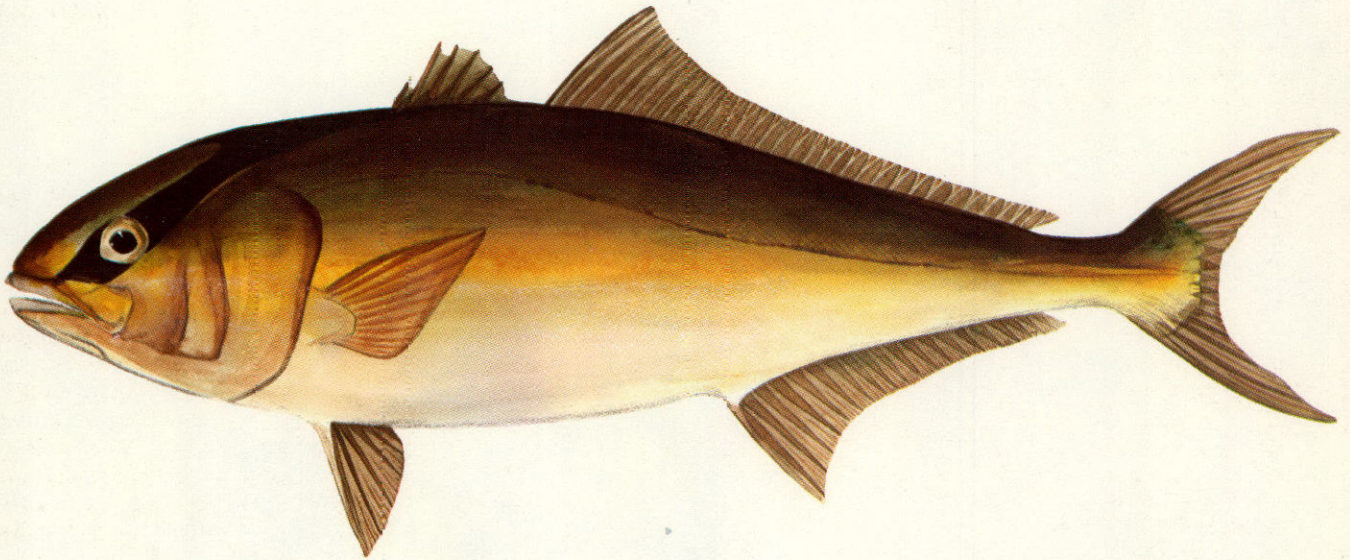
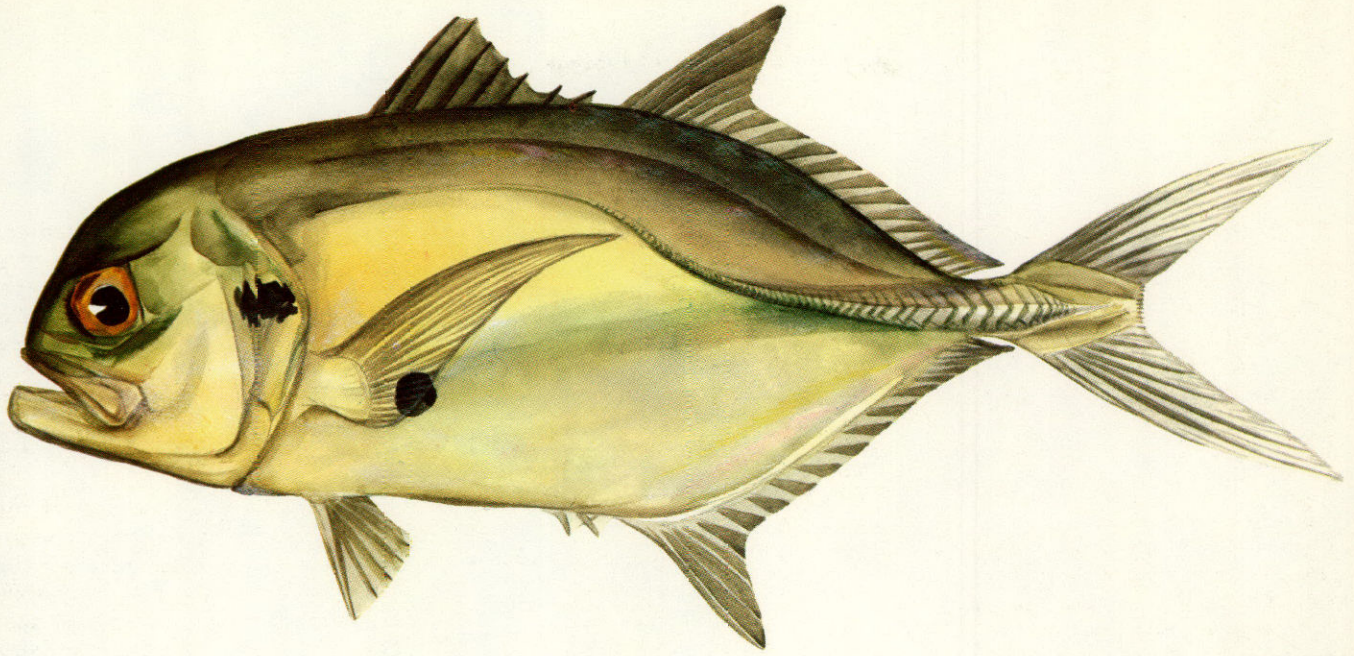
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## TEXAS SALTWATER FISHES

The common jack (top), also known as the jackfish or jack crevalle by Texans, ranges from Cape Cod to South America. Although the average fisherman catches jackfish in the 20-pound or less class, the fish occasionally surpasses the 50-pound mark. Our Texas record is a 49½-pound specimen which was caught in the Galveston surf in 1972.

The amberjack (bottom), also known as the coronado, is found in the Gulf and ranges from New Jersey to Brazil. Its average weight is 15 to 20 pounds, but it can exceed 100 pounds. The state record amberjack is 66 pounds, and was caught out of Port Aransas in 1972.

Artwork by Henry Compton.

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